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ABSTRACT

Part of a series of instructor training modules on related subjects instruction for apprentices, this booklet deals with developing instructional materials for apprentices. The first chapter consists of an outline of the scope and content of the instructor training modules as well as a self-assessment pretest. Covered in the module are preparing written instructional materials for adult learners such as apprentices; constructing useful performance-related examples, problems, and practice situations; developing competency-based, criterion-referenced materials; developing introductory overviews and summaries; and preparing self-instructional, individualized materials. Appended to the booklet are answers to the self-test exercises, a posttest, and answers to the posttest. (MN)

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ED227296

DEVELOPING INSTRUCTIONAL MATERIALS FOR APPRENTICES

Instructor Training Module #4

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Glossary

The words on this list are used in the booklet. Please review the terms and learn the definitions. The meanings of the works as used in the text may not be the form of the word with which you are familiar.

Words/Terms

1. *Abstract* To summarize or draw out the most important points
2. *Appropriate* Fit, proper and relevant
3. *Approximate* To estimate or make a reasonable guess
4. *Commonalty* The whole or mass of something
5. *Complement* That which completes or fills something
6. *Conjunction* An arrangement of things such that the items are considered or presented in association
7. *Criterion* A standard on which a decision can be reached
8. *Critical Attributes of Examples* Most important inherent characteristics of examples, elements that set them apart from everything else
9. *Critique* To consider the merits and problems of an example or event
10. *Cryptically* Written in code
11. *Decipher* To determine the meaning of something
12. *Diagnose* To identify, describe, analyze and draw conclusions
13. *Diversity* The condition of being different
14. *Duration* The period of time during which something lasts
15. *Expectation* Something anticipated or looked forward to
16. *Explicit* Clear
17. *Formulate* To put or state in exact form
18. *Hypothesis* An unproven conclusion drawn from facts
19. *Introductory Overview* Introduction to material that presents major points in a logical order that suggests their relationship to each other and other information
20. *Learning Characteristics* Distinguishing quality or trait that are important to the learning process
21. *Module* A set of learning materials
22. *Motivator* Technique or person that simulates or provides encouragement
23. *Non-examples* Instances of a situation for which the critical attributes are absent
24. *Obligation* Duty
25. *Prerequisite* Necessary to something that follows
26. *Process Information* To treat or manipulate knowledge, facts or data so as to gain understanding and mastery
27. *Range of Situations* The limits of the varieties of applicable instances
28. *Reinforce* To support and strengthen
29. *Sequence* To place in logical order according to some predesignated model
30. *Stimulus* An incentive
31. *Subsumed* To classify within a larger category
32. *Succession* The act of following in order
33. *Transition* Change or to pass from one condition to another
34. *Variations* Differences or diversities

1. How To Use This Booklet

What Is The Series About?

Related subjects instruction is an essential part of every apprenticeship program. It is the program component through which apprentices are taught the background theory and range of application of associated technical subjects such as mathematics, science and safety. Related instruction usually takes place in a classroom, after the regular work is over. Most frequently, related instruction is taught by a skilled tradesperson or craftworker. For the tradesperson or craftworker to be an effective trainer, he/she must not only know their trade skill, but also they must use teaching skills appropriate for conveying that information to apprentices. This series of materials is written to train related subjects instructors in the critical teaching skills necessary to perform their jobs effectively. The titles of the booklets in the series are:

- INTRODUCTION TO RELATED SUBJECTS INSTRUCTION AND INSERVICE TRAINING MATERIALS
- PLANNING THE APPRENTICESHIP PROGRAM
- PLANNING RELATED SUBJECTS INSTRUCTION
- DEVELOPING INSTRUCTIONAL MATERIALS FOR APPRENTICES
- PRESENTING INFORMATION TO APPRENTICES
- DIRECTING LEARNING ACTIVITIES FOR INSTRUCTION
- PROVIDING FOR INDIVIDUAL LEARNER NEEDS
- CONTROLLING INSTRUCTIONAL SETTINGS
- EVALUATING APPRENTICE PERFORMANCE
- COMMUNICATING WITH APPRENTICES

The first booklet introduces the series, describes the content of each booklet, and provides an overview of apprenticeship and of adult learners. The second booklet describes how to plan an apprenticeship program and may be used by related instructors, sponsors or service agencies. Each of the other eight (8) booklets deals with a set of training skills judged by a panel of experts on apprenticeship to be critical to working effectively as a related subjects instructor.

What Is This Booklet About?

Think about the different ways you learn new information . . . sometimes you watch someone work; sometimes you learn through trial and error by trying to do something and refining your skills over time; sometimes someone explains to you how to do something; and sometimes you learn by reading instructional materials, studying examples and working problems. Each type of learning is used in apprenticeship. Instructional materials are especially useful in related subjects instruction. They are major vehicles for presenting information, reinforcing learning, and demonstrating the applicability of information to the apprentice's work.

Preparing instructional materials is a critical training responsibility for you as a related subjects instructor. To perform the task successfully, you must understand the characteristics of adult learners and develop materials that capitalize on the strengths of such learners. You must provide the most appropriate kinds of materials for adults to use in committing information to memory and in using information in action. Also, you must help to demonstrate the job-related applicability of the material you present. This booklet provides instruction in five of the most important skills involved in preparing instructional materials for adults:

1. Prepare written materials for adult learners such as apprentices;
2. Construct useful performance-related examples, problems and practice instructions;
3. Develop competency-based, criterion-referenced materials;
4. Construct advanced organizers and summaries; and
5. Prepare self-instructional, individualized materials.

What Must I Do to Complete My Work in This Booklet?

Working your way through this booklet will require you to read the text, to answer the questions, to perform the exercises, and to complete the pre- and post-assessment instruments. Expect to spend about five hours working through the materials. The only resources you need to complete your work in this booklet are: (1) a copy of the booklet; (2) a pencil or pen; (3) about five hours of time; and (4) recollection of past related instruction experiences.

The materials are written in a self-instructional, programmed format. You may work through the text, examples and questions at your own pace and leisure; you need not complete your work in the booklet at one sitting.

Each chapter in the booklet is devoted to a single skill. The general format of the chapters is similar, with the following parts:

1. An *introduction* describing the skill and the instructional objectives for that skill.
2. *What* is, *when* and *why* to use the skill.
3. Step-by-step *directions* for how to perform the skill.
4. An *example* of how the skill is used in related instruction.
5. Additional sources of *information*.
6. A *self-test exercise* to apply the information about the skill.

This booklet concludes with an appendix that contains the answers to the self-test exercises from each chapter and the posttest.

Your activities in working through this booklet should include, in order, the following things:

- Complete the self-assessment and score it using the key;
- Read and consider in detail the introduction and objectives for each skill;
- Read and study the text, examples and illustrations provided for each skill;
- Complete the self-test exercise for each chapter and compare your answers with those provided in the appendix;
- If you complete the exercise as directed, continue your work in the booklet. If you fail to answer the questions correctly, repeat your work in the chapter under consideration; and
- At the conclusion of the booklet, complete the posttest for the unit. Check your answers against those provided. If you exceed the criteria, continue your work in the next booklet; if you fail to demonstrate mastery, repeat portions of this booklet as needed.

How Much Do I Know About the Subject Before I Begin?

The self-assessment will assist you to focus on competency areas associated with preparing instructional materials for adult learners. Read each competency statement listed in Figure 1 and assess your level of knowledge about and your level of skill in performing that task. Knowledge means what you know about the subject while skill means your experience in successfully performing the task. Circle the number that best describes your level of knowledge and skill. Competencies where your ratings are poor or fair are those on which you should concentrate. Pay particular attention to the chapters which deal with those competencies.

Figure 1: Developing Instructional Materials For Apprentices Self-Assessment

Chapters	Competencies		Rating			
			Poor	Fair	Good	Excellent
Skill: Prepare Written Instructional Materials for Adult Learners Such as Apprentices	1. Write Materials at appropriate level of difficulty for adults.	Knowledge	1	2	3	4
		Skill	1	2	3	4
	2. Reduce stress in learning situations for adults.	Knowledge	1	2	3	4
		Skill	1	2	3	4
	3. Link new materials to old to help insure the understanding of them.	Knowledge	1	2	3	4
		Skill	1	2	3	4
	4. Develop materials with a concrete reference.	Knowledge	1	2	3	4
		Skill	1	2	3	4
	5. Use combination of written and visual methods to convey information.	Knowledge	1	2	3	4
		Skill	1	2	3	4

Chapters	Competencies		Rating			
			Poor	Fair	Good	Excellent
Skill: Construct Useful Performance Related Examples, Problems and Practice	6. Develop and use examples during instruction.	Knowledge	1	2	3	4
		Skill	1	2	3	4
	7. Use problem solving for practice.	Knowledge	1	2	3	4
		Skill	1	2	3	4
	8. Use drill for practice.	Knowledge	1	2	3	4
		Skill	1	2	3	4
	9. Use case study for practice.	Knowledge	1	2	3	4
		Skill	1	2	3	4
	10. Use simulation as practice.	Knowledge	1	2	3	4
		Skill	1	2	3	4
Skill: Develop Competency-based Criterion-referenced Materials	11. Identify competency areas for materials development.	Knowledge	1	2	3	4
		Skill	1	2	3	4
	12. Developed competency-based materials.	Knowledge	1	2	3	4
		Skill	1	2	3	4
Skill: Develop Introductory Overviews and Summaries	13. Develop and present summaries.	Knowledge	1	2	3	4
		Skill	1	2	3	4
	14. Develop and use introductory overviews.	Knowledge	1	2	3	4
		Skill	1	2	3	4
Skill: Prepare Self-instructional Individualized Materials	15. Determine alternative learning activities for an individualized learning module.	Knowledge	1	2	3	4
		Skill	1	2	3	4
	16. Write an introduction and directions to a learning module.	Knowledge	1	2	3	4
		Skill	1	2	3	4
	17. Prepare instruction sheets containing subject matter and technical information.	Knowledge	1	2	3	4
		Skill	1	2	3	4
	18. Produce an individualized learning packet.	Knowledge	1	2	3	4
		Skill	1	2	3	4
	19. Manage individualized materials.	Knowledge	1	2	3	4
		Skill	1	2	3	4

2. Skill: Prepare Written Instructional Materials for Adult Learners Such as Apprentices*

Introduction and Objectives

Adults have particular learning preferences and characteristics that you must incorporate into the design of written instructional materials in order for materials to be effective and efficient vehicles for learning. The preferences and characteristics include:

- Adults need to feel ownership of knowledge and skills in order to accept and use information.
- Adults must visualize, apply and practice skills and knowledges.
- Adults prefer to work with materials that are explicit, concrete, and related to practical, personal experience.
- Adults tend to learn less effectively in anxious and stressful situations.
- Adults usually will attempt to relate new information and skills to prior learning and experience.
- Adults prefer to work with materials that are clear and offer certainty about the points under consideration.
- Adults are not necessarily proficient learners and usually differ dramatically in individual abilities and prior experiences.
- Adults are more proficient in remembering visual stimuli as compared with written word stimuli.
- Adults process verbal information better than any other form of communication.
- Adults prefer to work with relatively smaller amounts of material at one time.

Each listed characteristic has implications for preparing written instructional materials for apprentices. In this chapter, you will learn how to account for these characteristics in adapting or developing materials to use in related subjects instruction. When you have completed your work in this unit of materials, you will demonstrate your competence by being able to:

1. Suggest a variety of strategies for preparing useful instructional materials for adults.
2. Critique samples of materials, suggesting problems and potential solutions for the materials.
3. Prepare effective and efficient instructional materials for your own use.

When and Why to Use the Skill

In related subjects instruction there is a relatively small amount of time to deal with a large amount of material. You must be certain that the materials you use make effective use of the time available. Further, you must be sure that the materials you use are written for apprentices, given (a) that adult learning characteristics differ somewhat from the characteristics of other learners and (b) that usually related instruction occurs at a time which may not be the best for learning.

The time for improving written instructional materials is continuously throughout the instructional period. Of course you should check the materials thoroughly before using them and make any necessary modifications, adaptations, and corrections. In addition, as apprentices use the materials, look for problems and note changes that you must make before you use the materials again. In time, you will develop a set of materials that are both effective and efficient for adult learners.

How to Prepare Written Instructional Materials for Apprentices

There are a set of procedures that take into account the characteristics of adult learners, that you can employ to revise or develop instructional materials for adults. Rather than listing them in steps, these strategies have been organized into one of three groups according to the learner characteristic with which they are associated. Use those that are applicable to your situation to improve instruction.

Learner Characteristic: Need To Be Comfortable With Learning Situation

Adults prefer to learn in relatively less stressful, less anxious situations. Often unknowingly, stress is introduced into the learning setting through factors such as lack of clear expectations or materials of inappropriate

* The discussion of characteristics of adult learners and developing instruction materials for adults was compiled and adapted from over one hundred sources, including, for example, *The Adult Learner: A Neglected Species* by M. Knowles (1978); *Adult Psychology* by L.J. Beschoff (1969); "Cognitive Changes in Adulthood" by J.H. Flavill (1970); *Teaching Adults Effectively* by A.B. Know ed. (1980); *Teaching Adult Lessons* by D.M. Snow, ed. (1979); and *Models of Teaching* by B. Joyce and M. Weil (1972); and the work of the principle author of this booklet.

length and difficulty. Remember, adult learners are even more different as individuals than younger learners because of different life experiences.

Be aware of the potential problems associated with this group of learning characteristics. Apply several relatively simple strategies to correct the difficulties with the materials you use. For example, you can remove uncertainty by writing out and explaining performance objectives that express the expected outcomes of instruction. You can reduce anxiety and confusion further by consistently providing introductory information and directions that describe what will occur during instruction. Mention concerns like time use, resource requirements, use of materials and equipment, sequence of activities, and evaluation in these directions. For example, some instructors post a written schedule of each related instruction session on the door before class. Other instructors begin class by explaining what will happen during the session. Consider opening the instructional session by saying something like:

> Tonight we will talk about metric and conventional measurement. We will learn the basic units of linear measure for each, practice converting measurements from one system to another, and take measurements of objects in the room. We will have a ten minute quiz on converting measures to and from the metric system at the end of the period. Also, we will take a ten minute break after the first hour of class.

A second strategy that reduces stress is preparing and using materials that permit trainees to experience success while learning the information. If you prepare materials in a competency-based format you will improve the probability of this type of success occurring. Preparing competency-based materials is one of the skills presented in this booklet.

The most important single factor in developing useful written instructional materials that reduce stress is preparing materials that are written at the appropriate level of difficulty for adult learners. On the average, adults can work effectively with six to seven items of new information at any one time. Ability to work with information is limited by three factors: (1) attention span and reading level of the reader; (2) the sheer volume of words to be read; and (3) the time it takes to commit information into long term memory. Given these factors, you should limit instructional materials to written segments of five to ten typed pages per major point in the lesson. Additionally, you should not exceed six to seven major points in any one lesson. Usually your presentation will be most effective if you deal with only five. Further, if at all possible, adapt materials such that they become self-paced materials. This allows for differences in reading ability—both speed and comprehension. Also self-pacing allows time for the apprentice to process the information and to commit it to memory. Taken together, these strategies provide the adult learner with a sense of control over use of the materials. The strategies reduce the possibility of feeling overwhelmed by large amounts of new materials.

Characteristic: Need For Ownership of Information and Skills

Adults learn best when they perceive that they own or possess individually the information and skills under consideration. This need is expressed in three primary ways. First, when reading about rules, concepts and principles, adults process the information in their own words during the after reading in order to derive the meaning of the passage and commit it to memory. Second, when working with ideas, directions, and skills, adults actively imagine situations where they mentally take the role of a person using the information or skill. As they visualize the situation, behavior and consequences of action, they commit the skill or knowledge to memory. Trial and error through practice permits more realistic and vivid information processing to occur. Third, adults usually will attempt to deal with new information initially by trying to compare or associate the new information with prior learning.

Each of these three factors associated with the need to feel ownership of new knowledge and skills has specific implications for you as you design or adapt instructional materials. For example, consider the situation where adults restate rules and principles in their own words. Since you know it will happen, be certain that the materials are written at a level of difficulty that matches the reading skills of the learner. In general, vocabulary should be geared to the tenth to twelfth grade level for most adults. While some trainees will finish quickly, most learners will be able to work steadily and will recognize the vocabulary used in the materials. This means that the vocabulary will be slightly more difficult than that used on the editorial and front pages of most major newspapers.

In addition to vocabulary, check the manner in which the words are organized into sentences. Where possible, most sentences should conform to the standard form of English sentences. This means that the majority of sentences should contain a subject—usually a noun—at the beginning of the sentence together with a predicate, introduced by a verb, that immediately follows the noun. In addition, usually there will be short descriptive phrases in either the subject or predicate. Avoid long sentences and compound sentences. Further, use action verbs that describe concrete occurrences to involve the trainee in what you are saying. Sentences of this type help to build mental images that assist in understanding information. Give particular attention to the first sentence of each paragraph. It is called the topic sentence and should express the major

point that will be developed by the entire paragraph. It is the one sentence that virtually every learner will read so be sure that it introduces the point you want to make.

In addition to restating rules and concepts in their own words, adults imagine themselves using new directions and skills. They consider the sequence of activity, the specific directions and the consequences of action. Either by developing this mental image or by practicing, adults can commit to memory an entire sequence of information or activities. As an instructor, provide adequate amounts of both examples and practice situations to permit learners to process the information and skills under consideration. Remember, adults learn best through practice and concrete examples. Another of the skills addressed in this module teaches you how to develop and use examples and practice situations in the instructional setting.

In designing instructional materials, also consider adults establish ownership by comparing new information with prior learning. Specifically, if you can provide written explanations and comparisons of new and old information, then you can assist the trainee to master the information. The more familiar the message is to the audience, the more rapidly the meaning will be perceived and the more easily it will be learned. Similarly, if you clearly point out differences between the new and old information you will help the learner avoid confusion between the two ideas and aid in accurate learning. Therefore, when possible, help the learner compare new and old materials accurately and explicitly. Where possible, use older material to improve learning, since once learned it becomes part of the trainees' prior experience.

Characteristic: Need For Explicit, Concrete Information

Adults learn best when they work with explicit, concrete information. Include this type of information in your presentations by using the following guidelines in your teaching.*

1. After presenting each major idea, ask questions of trainees. Ask two kinds of questions. First, ask factual questions about the major points of the lesson. Second, and more important, ask application questions that require the learner to transfer the information and skill to a new situation in order to answer the question. Questions force trainees to consider concrete instances of the information and result in making the information more personal in nature.
2. Include examples and practice situations in the materials. This is probably the single most useful way to make the new information and skills relate to personal experience. Also it makes the information concrete and real. One of the other units in this module is devoted entirely to developing and using effective examples and practice situations.
3. Present information in both written and visual form. Written information is particularly useful for teaching difficult concepts because it can be reread as many times as necessary. In addition, information dealing with time or sequence usually is better presented in written form while information dealing with space usually is better presented in visual form. When both narrative and visual forms are used to explain a concept, rule, idea or skill, the probability of effective and efficient learning is increased. Use diagrams and line drawings as visual materials because they emphasize major points while eliminating distracting information.
4. Include verbal and visual cues in written materials to highlight major points, particularly if the materials are long or difficult to understand. Use the cues consistently. Often handwritten notes in the margin are the most effective cue.
5. Arrange sections of the material logically and anchor each to a major idea or organizing concept. In general, ordering information according to chronology or by reasoning from concrete examples to abstract principles is the most useful sequencing procedure for use with adults. In addition, consider developing and using an introductory overview and a concluding summary for the materials. This module contains materials that explain how to develop and use these two devices.
6. Develop a standard writing format and use it consistently throughout the materials. All learners, especially adults, establish a learning pattern if materials are consistent. Once having established a pattern, trainees are very efficient learners as long as the information conforms to the pattern. These modules are an example of a type of pattern learning. Each chapter is devoted to a single skill. Within each skill, the format for information is virtually identical and includes an introduction and objectives; and explanation of when and why to use the skill; instructions in how to use the skill; an example; and self-test questions.

Figure 2 is a checklist of the major considerations for preparing written materials for adults. Use it to assess the written materials you use currently in your related subjects class.

* Module #6 of this series, *Directing Learning Activities for Instruction* contains directions for asking good questions and for ordering information.

Figure 2. Checklist of Factors to Look for in Well Written Instructional Materials

Characteristics	Yes ◄——► No
1. Are clear concise performance objectives provided?	
2. Are complete, specific directions included?	
3. Are major points limited to no more than 6 to 7 per lesson?	
4. Is the number of pages per major topic 10 or less?	
5. Are the materials self-paced?	
6. Is the vocabulary about as difficult as that used in major newspapers?	
7. Do most sentences follow the standard form of English sentences?	
8. Do the topic sentences of paragraphs contain the essential information of the paragraph?	
9. Does the material provide examples that illustrate application of ideas?	
10. Does the material include ample practice opportunities for lessons?	
11. Are the materials written in a competency-based format?	
12. Do the materials compare new information to information covered previously?	
13. Do the materials include appropriate questions?	
14. Are combinations of narrative and illustrations used to teach the most important information?	
15. Is information organized around a central anchoring idea?	
16. Are learning tasks and requirements consistent throughout the materials?	
17. Is introductory and summary information included?	

Figure 3. St. John's Rating Results

Characteristics	Yes ◄——► No
3. Are major points limited to no more than 6–7 per lesson?	✓
4. Does the material include simple practice situations?	✓
5. Do the sentences follow standard English construction?	✓
6. Is the number of pages per major topic ten pages or less?	✓
7. Are the materials self-paced?	✓
8. Do the materials include appropriate questions?	✓
9. Are clear, concise performance objectives provided?	✓

Example

David St. John, a related subjects instructor for several years, began to review the instructional materials he had used for the last two years. He reviewed five clusters that he selected randomly from his materials and used the checklist included in this module. A portion of his rating is illustrated in Figure 3.

Given the results of this portion of the materials rating, St. John set out to correct the problems he noted. He reorganized the content, dividing materials into topics and subtopics of reasonable length. Next, he rewrote some of the subtopics using a standard format of (1) definitions, (2) application, (3) example and (4) practice situations. He included three examples and two situations for each topic. Number of pages per topic was limited to ten pages including two pages of examples and one page of practice situations. He continued to use the suggested performance objectives and most of the questions included in the original materials. While St. John did not follow every suggested guideline for writing materials, he found that the apprentices learned more quickly and demonstrated greater interest.

Additional Information

You may find that reading sources like the following will help you prepare effective materials for training adults:

M. Knowles. *The Adult Learner: A Neglected Species* (Houston, Texas: Gulf Publishing Company; 1978).

O. Milton and Associates. *On College Teaching: A Guide To Contemporary Practices* (San Francisco: Jossey-Bass; 1976).

Self-Test Exercises

Answer the questions below in the space provided or on work paper. Compare your answers with those provided in the appendix of the booklet.

1. What are the specific ways that you can help adults to feel ownership of materials through instructional design?

2. Describe specific precedures of instructional design through which you can make adult learners more comfortable in the learning setting.

3. How should written and visual information be presented?

4. Take the checklist provided in Figure 2 and use it to evaluate some of the written material you use. If at least 6 items are rated on the "No" side of the continuum, begin to rewrite your materials.

3. Skill: Construct Useful Performance Related Examples, Problems and Practice Situations

Introduction and Objectives

Adults have somewhat different learning characteristics from children or adolescents. Adults prefer explicit, concrete information; they prefer information that is associated with their own personal experience; and they prefer to work with information that has fairly immediate applicability. In addition, adults generally are more proficient at applying information to practical situations than are younger learners. Each of these characteristics reinforces the need for you as a related subjects instructor to construct and use performance related examples, problems and practice situations in your instruction. Examples, problems and practice situations use adult preferences for concrete, applicable, personal information to maximum advantage. This chapter will train you to prepare the use examples and practice problem situations. When you have completed your work in this unit, you will demonstrate your competence by being able to:

1. Critique examples, problems, and practice situations applicable to a related subjects instructional situation;
2. List and discuss the general guidelines for constructing and using good examples and practice situations; and
3. Develop useful examples and practice situations as they apply to your own related subjects instruction.

Why and When to Use the Skill

For adults to learn effectively, they must develop a sense of ownership of the information and skills under consideration. This means that adults must encounter and process information: (1) in ways that enable them to translate written materials into their own words and (2) in ways that permit them to place themselves in roles in which the information under consideration is applied. In general, adults must practice skills in order to learn them. This means that the construction and use of examples and practice situations may be the most critical of all training tasks in related instruction. You must be certain that you provide enough examples and practice —both in terms of numbers of example practice situations and in terms of range of behaviors displayed in the examples and practice situations. Further, you must be sure that you provide the examples and practice at appropriate times throughout the lesson. Remember that examples and practice situations can be used (1) to introduce major points, (2) to reinforce learning, or (3) to present information as the lesson itself. You will stimulate learner interest and attention by using examples and practice situations in each of these three ways. Examples and practice situations are the most direct means available to you as an instructor to use the characteristics of adult learners to good advantage in the related subjects setting.

How to Construct and Use Examples

Examples are the most useful and least complicated instructional means at your disposal to associate the information under consideration to the personal lives and work of apprentices. Examples fit the learning characteristics of adults in that they are explicit, concrete, and personal in nature. Their worth is determined by the degree to which they make the major points of the lesson real, practical and useful.

Examples are not difficult to prepare or use in an instructional setting. Use the suggestions listed below to prepare effective examples.

Step 1: Review Major Points For Which You Want To Use Examples

Examine your lesson plans and materials and note the parts that you want to introduce, illustrate or teach by way of example. List those points on a sheet of paper so that you can recall each of them as you prepare and use the materials. Also, review the trades and year of training for each of the apprentices in your charge as you choose examples. Make certain that you select examples that will be useful to all apprentices or to groups of apprentices in instruction.

Step 2: Generate Examples For Each Major Point

After listing each major point for which you want to use an example, begin selecting personal experiences to use. Also involve apprentices in supplying examples. More specifically, after you have presented the information on a topic such as safety or basic mathematics, ask each apprentice to bring to the next related subjects lesson one, two or more examples drawn from their

own current work experience for each of the major points you made during instruction. Such examples should be written up briefly on small note cards and need take no more than 5–10 minutes of apprentice time. As you collect the note cards, scan the suggested examples. Use several immediately by way of review. Retain the other suggested examples to incorporate into practice situations or to use in the future as you review the material or teach the lesson again.

As you develop examples, construct examples that emphasize major points and that demonstrate the practical range of the information under consideration. You will need at least two or three examples for each point you expect to make. Construct examples so that the most critical attributes of the example—the major points you are teaching—are the major points of attention. The critical attributes of each example should be very much alike since these are the major points to be made. The less important information, however, should be quite different and should attract relatively little attention. Remember, examples should accent the critical information and demonstrate the diversity and range of situations covered with the information or skills.

Imagine related science instruction as an instance of example use. Say you were providing training on the concepts of force and simple machines. In discussing levers you might suggest tools such as crowbars, pliers, and tinsnips as examples of levers. You then might ask each apprentice to look at tools on their jobs and to suggest at least two other tools that are levers or that use the principles of a lever.

Step 3: Select or Construct Non-Examples

Non-examples are in a sense the opposite of examples. In non-examples, the major attributes of the situation being explained do not match or demonstrate the major points of the lesson. Non-examples demonstrate common mistakes or situations in which the major points of the lesson cannot be applied. Likewise, non-examples may demonstrate critical attributes that are close to but not quite the information under consideration. Non-examples should be used to limit the range of applicability of the major points you are making. You should try to use two non-examples for every three examples during the lesson.

In terms of the situation of a related instructor teaching about levers as simple machines, the instructor might, after discussing the critical attributes of a lever, discuss with apprentices a variety of simple machine-type tools like screws, hammers, chisels and so forth. By comparing each tool to the attributes of a lever, the instructor can demonstrate how to distinguish a lever from other machines as well as discuss the principles and applications of a lever.

Step 4: Prepare Necessary Materials for Lessons

To get the greatest return from use of the example, prepare examples in advance of their use in the lesson. Remember, examples can be visual, auditory, or written. They can take the form of models, demonstrations, charts, figures, audio or video tapes, or references to activity. Many times you will need to prepare a handout, overhead or diagram to use as part of the example. Always do this in advance of class. Be certain to make enough copies to distribute. If equipment is involved, be sure that it is in working order and that you know how to operate it.

In terms of the example of explaining levers and force noted in Steps 2 nd 3, you might bring to class a variety of tools. Demonstrate how each tool is an example or a non-example of a lever. You even could have apprentices identify the component parts of the lever like the fulcrum and force arm for each tool.

Step 5: Sequence/Order the Examples

Sequence or order the examples in the manner in which you wish to use them in the lesson. The two most useful ordering devices are "concrete to abstract" and "specific to general." In each instance the information highlighted in the first examples you present is used to develop the information in the later examples. See Module #6 for specific instructions about how to order or sequence materials. When you have decided on the sequencing, make notes to yourself about the order in which you will present the examples during the lesson.

Step 6: Use Examples in the Lesson

The most critical aspect of developing examples is, of course, using them in the lesson. Use the following guidelines to get the maximum return for your invested time and effort.

- Before introducing the example, unless it is being used to motivate learners, indicate what important prior information the example is related to. If necessary, again provide definitions, explanations and lists of attributes.

- As you use the example, remind the learner of the critical attributes or information demonstrated by the example. Do not mention the less critical information.

- Avoid distracting information. If you are teaching concepts, often verbal examples are more useful than visual examples because they contain fewer distractions. In similar fashion, line drawings and charts are more effective than realistic pictures because they contain less distracting information.

- As you present the examples, offer them in close succession to one another. Emphasize the commonness of critical attributes across examples as well as other comparative information. Multiple examples provide much better continuity of thought than do single examples.
- If teaching a concept or skill by way of example, always use the skill or concept name with each example. This will help to reinforce the commonality of the attributes under consideration.
- Remove as much irrelevant and distracting information as possible when working with examples. Be certain that the initial examples are as clear as possible. Use no non-examples early in the lesson.
- Present the examples in conjunction with the rules/concepts/skills they teach and illustrate. It does not matter whatever the example or the definition comes first. When in doubt, use the more simple first. However, always present them in close proximity to one another.
- Allow time for apprentices to consider the examples, to think about them, and to ask questions. Obtain feedback from learners about examples and correct any misunderstanding.
- At the conclusion of the lesson, offer a summary of the major points of the lesson. Reemphasize the examples or offer a new set of examples as a set of final ideas.

How to Develop and Use Practice Situations

Practice situations extend the idea of examples by requiring trainees to apply new knowledge or skills. Application is absolutely critical to related instruction since adults learn better through practice than by any other means. As an instructor, you must insure that the apprentices in your charge have ample opportunity to practice, both in terms of amount of practice and in terms of range of different types of applications demonstrated in practice situations. Remember that for adults, the amount and range of practice, not the repetition of identical situations, are the critical ingredients for learning.

Practice offers the opportunity to apply knowledge and skills in a real, focused setting. The learner must be actively involved, must gather and use information first hand, must decifer the purpose of the application, and produce the product or outcome. Usually practice situations present problems similar to actual situations. Often practice focuses not only a single skill or bit of knowledge, but rather on the use in combination of several skills and information studied previously.

Practice situations can take a number of forms including case study, problem solving, simulation, and drill. Of these different forms, drill is usually the least effective while problem solving is usually the most effective. Whichever of these forms you choose to use, several general guidelines about preparing and using practice situations apply. These are:

- The main criterion for selecting an application situation should be the importance of the points the practice illustrates. Use only those examples that clearly focus on the major points under discussion. Avoid using practice situations that emphasize relatively unimportant points, confuse issues, or ignore the most important points.
- Practice situations should deal with combinations of skills and knowledges rather than with isolated information. The idea is to combine knowledges learned in isolation into an entire behavior to respond successfully to the practice situation.
- Keep the directions short and direct. Indicate what is expected. However, because practice situations are based on information under consideration, the learner should either know what and how to proceed or, at least, how to reason what to do.
- Provide enough background and basic information to complete the practice situation. Remember that apprentices do not have as good a grasp of the information or as much experience as you have. Some things about the subject under consideration that you take for granted may be entirely new to them.
- Be sure that the practice situations you develop have a clear purpose, are focused on a single particular bit of information, and are realistic in context. Further, be sure that learners must gather or process information during practice and that apprentices must take action in the practice situation to be successful.
- As with all instructional materials for adults, use appropriate language. Be sure that any necessary definitions, concepts, rules and so forth have been addressed adequately before undertaking the practice. Provide all necessary materials, tools and supplies.
- Devote a portion of each lesson to practice. Always provide an opportunity for adults to apply the information under consideration. Often as much as a quarter of the instructional time should be devoted to practice. Further, as long as the practice situations are interesting and stimulating you will find adult learners enthusiastic about participating in them.
- It usually is a good idea to introduce the practice session by reminding the learners about the major points of information and skills under consideration.

As mentioned earlier, there are four major types of practice situations: drill, simulation, case study and problem-solving. Each has its advantages and limitations and each has its own set of directions to follow.

Drill

Drill means repetition in practice. Usually it is used to try to improve the speed and accuracy of performance on a subject. The idea is to fix the major information firmly in the learner's working memory and insure an accurate response. While it has the disadvantages of being boring and can not be used with more difficult or elaborate information, it is useful for reinforcing learning of manipulative and manual skills. Further, it can be useful if you have a limited amount of time for practice and do not have time to do something else.

Drill can be used to master or review prerequisite information upon which more advanced knowledge and skills are based. Likewise some information requires multiple exposures before it is mastered. Multiplication tables and safety procedures are two examples. The general directions for using drill are:

1. Use drill if speed, accuracy and automatic responses are desired outcomes of learning; avoid using drill in most other situations.
2. Make sure that you explain the purpose, expected outcomes and directions for the drill.
3. Be sure that the information and procedures used in practice are correct.
4. Do not overuse or it surely will produce boredom. You can use games or contests to make drill more acceptable.
5. Set aside a specific few minutes for practice. Move rapidly into, through and out of the session. First indicate what and why you will do it. Then give the directions followed immediately by the practice sessions. Monitor and orchestrate the practice session to be sure that it moves quickly.
6. Conclude the practice session by reviewing what has occurred and how well the apprentices performed.
7. If necessary, repeat important instructional information during the lesson.

Simulation

Simulation involves apprentices playing roles with specified characters and rules in situations resembling the work environment. There is a specific objective or purpose to the simulation. It is highly motivating and includes the active involvement of all learners although it is sometimes difficult to get started and to orchestrate while in progress.

Simulations can be time consuming to create and to use. Often they require development over months or years, with a good bit of refinement. Usually simulation involves learners in making decisions while trying to achieve objectives. Frequently simulations involve competition among learners or teams of learners for scores or prizes. The general directions for using simulations are:

1. As the instructor you must adapt or develop the simulation to your particular instructional needs and learner group. Develop the objectives, roles, rules and directions in advance. Become completely familiar with the simulation before using it.
2. As the instructor, introduce, explain, orchestrate, and reinforce the simulation. Be consistent and enthusiastic. In large measure, the success of the simulation depends on how well you perform the tasks.
3. The simulation must be as close as possible to reality to be effective. This too must be made clear in the focus and explanation of the simulation. The rules must be used to help conform to reality. They must be explicit, well explained, and followed. Limit the simulation activity to the most critical aspects of actions, processes and skills that you are trying to teach.
4. You must be flexible in several ways including: (a) allowing learners to follow through with their decisions; (b) allowing movement; and (c) allowing for enough time to complete the simulation.
5. At the conclusion of the activity, provide for discussion of activities, summary of outcomes, and review of major points of emphasis. Recognize outstanding achievements as they occurred during the session.

Case Studies

A case study is a practice situation that often is taken from real life and can be adapted to meet individual differences among learners. It is a written description of a realistic situation to which the apprentice must respond. Often a case study is presented as a kind of problem which the trainee must actively solve, using required knoweldges and skills and the information presented in the case study.

Among the advantages of using case studies as practice situations are the active learner involvement and motivation that it stimulates, the realism it conveys, and its ability to allow trainees to create unique responses to the case. It can be extremely useful for training apprentices to gather information and make decisions. When used, trainees ultimately make decisions and recommend courses of actions. The disadvantages are that the process can be time consuming in both preparation and use. Further, sometimes there are multiple correct answers in case studies thus complicating evaluation. Case studies are not applicable to training for manipulative skills. The general directions for using case studies are:

1. Decide how you will evaluate learner progress and outcomes before beginning the exercise. Make necessary provisions for evaluation.

2. Write up and present the case study to trainees. Each "case" should contain expected learner activities, pertinent data, time period restrictions, and any other specifics that you decide to include.

3. Background information, directions, purposes, goals and rules must be written simply and clearly. Clarify expectations and the situation so that the case is unambigious. Use simple language and explain what skills must be used.

4. Be sure that all necessary materials and information either is supplied or is available to the learners.

5. After introducing the materials, check on trainees periodically to be sure that they are progressing in a satisfactory manner. You might choose to determine how learners are analyzing the situation and applying acquired knowledge and skills by discussing briefly what they are deciding, why they made the decisions, and what they are going to recommend.

6. At the conclusion of the case study period, review what has happened, the types of conclusions and recommendations developed by the apprentices, and the ways in which they reached these decisions.

Problem Solving

Problem solving is probably the most useful type of practice situation. You can construct problems from your own work experience or from the examples of major points offered by the apprentices. Pose problems either in writing or verbally. Remember, problems must be real or realistic and must actively involve the learner in four steps:

a. Identify and diagnose the problem and its component parts by developing and testing hypotheses concerning the problem.
b. Consider possible strategies for solving the problem.
c. Select a strategy to use and secure the information, tools, equipment and so forth to apply the selected strategy.
d. Solve the problem and check the problem resolution.

As the instructor, you have the opportunity and obligation to check apprentice understanding of the information under consideration in each of the four steps. Check on both products and procedures. This is especially important because many problems have multiple solutions.

The advantages of problem solving include the motivational benefit of having learners directly and actively involved, the benefits of individual apprentices processing the information and using the skills required to work on the problem, and the benefits of most solutions requiring use of multiple skills and information. Another useful outcome of using problem solving is the improved understanding and retention of information due to the intensity of involvement of the apprentices. Other benefits include the usefulness of learning to use the general problem solving model and increased responsibility of the learner for his or her own behavior. Limitations are the time required to use the technique and the difficulty in evaluating the results. The general directions for using problem solving are:

1. Formulate the problem or set of problems, usually based on examples from the workplace. Provide enough information in the problem statement that the apprentices can understand what they are being asked to do. This means that you must provide some structure for problem identification and diagnosis. Be certain that the problem, as you present it, involves the major information points and skills in the lesson and can be addressed—and usually solved—without knowing other information to which the apprentice would not have been exposed. Be sure the problems you select are important.

2. Write out the problem or problem set. Prepare all necessary handouts, overhead transparencies, displays, data sets and any other materials that are needed to present, identify, and diagnose the problem.

3. Present and explain the problem. Emphasize expectations concerning procedures, outcomes, and time periods for performance. If there are any special conditions, be sure you note them. Also, it is usually useful to mention expected evaluation procedures. Frequently it is a good idea to introduce the problems by referring again to the major points under consideration and by reminding apprentices of work place examples of the information and skills under consideration.

4. Consider working a sample problem aloud for apprentices. Often it is useful to demonstrate how one organizes information, formulates and tests hypotheses, devises sample strategies, chooses among strategies, implements strategies and reviews results.

5. Provide necessary materials, equipment and information to engage successfully in problem solving.

6. Check the procedures and products that are used by apprentices in the problem solving exercise. Reinforce use of appropriate procedures and production of valuable interim products. Note incorrect or inaccurate use of skills and knowledges for later discussion.

7. At the conclusion of the exercise discuss the problem; apprentice findings, solutions and procedures; and expected outcomes with trainees. Note

strengths and limitations observed during the problem solving exercise. If necessary, review information or skill with which there was a problem.

Example

Samuel McCrory, master electrician, taught related subjects to electricians in an apprenticeship and training sponsored by a regional local JATC. McCrory used the materials, suggestions, and guidelines provided by the NJATC for electricians as his content and instructional materials. He drew the illustrations and examples used in class from his own long work experience. He noticed that many of the apprentices had difficulty with some of the trigonometry, applied mathematics, and blueprint reading parts of the curriculum even though they seemed to understand the examples he offered during instruction.

After reading this set of training materials for instructors, McCrory decided to develop practice situations to use during instruction. He decided that the case study method and the simulation method were not applicable to his needs. Initially he tried the drill method but found it somewhat unmanageable and boring when dealing with the issues under consideration. He therefore decided to try problem solving as a method of practice. He asked apprentices to bring to class brief written examples of major points of lessons. McCrory used those examples as the basis for developing the problem situations. He wrote out sets of three problems per major instructional point and set aside 30 minutes of each two hour instructional period to work on problems. He placed materials such as blueprints, math tables and so forth needed to work the problems on a resource table in the front corner of the room. As he passed out the written problems, he told each apprentice to begin work with a different problem, using the numbers in order to be sure that the resource materials would not be needed by everyone at the same time. He always discussed the problems as he passed them out; this included noting expected outcomes and points of emphasis. Sometimes he even worked a sample problem as a demonstration. As apprentices worked, McCrory circulated around the room to check on progress and procedures in use. He noted particular strengths and limitations of apprentice performance. At the conclusion of the practice period, he always reserved ten minutes to discuss the problems and apprentice findings. If necessary, he then used this information to reintroduce materials with which the apprentices needed additional work.

Self Test Exercises

Answer the questions below in the space provided or on separate work paper. Compare your answers with those provided in the appendix of the booklet.

1. What are the major strengths of the following type of practice situations:

   a. Problem solving

   b. Drill

2. What are the steps in using performance related examples?

3. Read each of the following scenerios. Critique the situation, and suggest possible solutions to the problem from the context of examples and practice.

   A) Joan Mitchell regularly used both practice and examples in her instruction for graphic arts apprentices. She used at least one example, for each major point, many of which were suggested by trainees. She always sequenced examples, prepared necessary materials and followed the directions for their use. However, too often her efforts were greeted by blank looks. What might have been the problem and how might it have been resolved?

   B) Peter Gordon tried to use practice situations in his instruction but always seemed to meet with failure. His drill was boring and dreaded; his problem solving efforts always seemed to be confusing and always ended with his working the problems on the board. What might have been the problem and how might it have been resolved?

4. Develop a set of problems and practice situations for the trainees in your charge to use in related subjects instruction.

4. Skill: Develop Competency-Based Criterion-Referenced Materials

Introduction and Objectives

The idea underlying competency-based instruction is that training should deal with those attitudes, skills and knowledges (competencies) that are needed to succeed on the job. Since competencies are job-specific there are many situations where preprepared competency-based instructional materials are not available for related instruction. As a result, it is frequently the responsibility of related instructors to develop their own competency-based, criterion-referenced materials —materials which are responsive to their particular instructional objectives. This chapter will prepare you for this instructional task. After completing the chapter you should be able to:

1. Describe the components of competency-based instructional materials;
2. Identfy competency areas appropriate for materials development;
3. Develop competency-based materials for use by your apprentices in related instruction.

Components of Competency-Based Materials

Competency-based, criterion-referenced materials are tools that you can use to convey knowledge, attitudes and skills to trainees. Each of the following components contributes to the development of competencies. In a sense they are building blocks through which competence is developed:

- *Background Information*—facts, knowledge, concepts, rules and principles on which competencies are based.
- *Application of Information*—illustrations of how knowledge, concepts and so forth are applied in the trade(s).
- *Competency Development*—opportunities for apprentices to develop competencies through practice and exercise.
- *Competency Demonstration*—opportunity to exhibit mastery of competencies.

Materials are individualized to the extent that apprentices are able to work at their own pace. This is because in competency-based instruction achievement is not measured by exposure time but by the attainment of competencies. You can improve the probability of success even more by providing for other differences in apprentice characteristics, such as motivations, preferred modes of learning and degree of independence. Thus, competency-based materials often take on the form of self-instructional, individualized materials. Developing individualized learning modules is the topic of the final chapter of this booklet. Use that information as you prepare to develop competency-based, criterion-referenced materials.

Why and When to Develop Competency-Based Materials

The major reason for using competency-based, criterion-referenced materials is to assure that instruction is relevant to the skills and knowledge required on the job. This in turn creates a favorable attitude on the part of the apprentices towards the materials as they see the utility of what is being learned. By generating a positive attitude toward learning, more is learned.

Competency-based materials offer an opportunity for the apprentices to practice what they are learning until competence is achieved. This attainment of a predefined criterion at an individual's own pace usually appeals to apprentices. People differ in their abilities and experiences, thus attainment of competencies will not always require the same amount of time or effort for all apprentices.

Because of the advantages of competency-based materials for job-related instruction, you should consider using them for providing instruction. Commercial materials are available for some competency areas. When materials are not available for particular instructional objectives or competency areas, you must develop them.

How to Develop Competency-Based Instructional Materials

A five-step process is suggested as the technique for developing materials. The first step is to identify competencies for materials development and to outline steps toward mastery of the competencies. The remaining four steps are guidelines for developing each of the four components of competency-based instructional materials.

Step 1: Identify Competencies and Steps to Mastery

The first step is to identify those competency areas or skills and knowledge where appropriate instructional materials are not available for your use. You can do this in conjunction with planning for instruction. First, identify content areas from your Plan for Instruction where materials are not available to provide background knowledge, application, opportunity for practice and demonstration of mastery. Then outline the steps for mastering each competency by answering the following questions.

Knowledge:
1. What background knowledges are required to acquire the skill?
2. Are the knowledges within your area of responsibility?
3. Are instructional materials available?

Application:
1. What applications of knowledge are most appropriate for your apprentices' occupational specialties?
2. Are instructional materials available?

Practice:
1. What practice situations would provide the best opportunity for apprentices to acquire the knowledge and skills?
2. Are materials available which offer opportunities for apprentices to practice the knowledges and skills until mastery is achieved?

Mastery:
1. In what ways could the apprentices demonstrate mastery of the competencies?
2. Are materials available to evaluate mastery?

Some of these questions you will have considered in preparing an instructional plan. Thus, this step reorganizes some of your planning in order that instructional materials may be easily developed.

Step 2: Prepare Background Information

This step involves either writing or assembling background information from which apprentices can gain the knowledge you identified in Step 1. When necessary, write background materials as an Information Sheet that consists of the following parts:

1. The competence or instructional objective addressed on the sheet.
2. An introduction which provides a rationale for the knowledge and an overview of the content of the instructional sheet.
3. The body of the instruction sheet describing critical facts, concepts, principles. The information may be conveyed through narrative text, a question and answer format or in outline form.
4. Resources for further information on the topic.

In writing the Information Sheet be clear and concise. Keep the material as short as possible. Additional guidelines for organizing and writing the material are:

- Have a solid foundation yourself in the area before you write. Update your expertise if necessary.
- Use a logical method for organizing information:
  - — Chronological order: as events occur in time
  - — General to specific information
  - — Concrete to abstract
  - — Prerequisite order: Present topics first which are required for subsequent knowledge/ concepts
- Present information in small steps. Break up written information with subheadings.
- Include adequate subject matter to make your point, but avoid redundancy.
- Use illustrations—drawings, charts, graphs, pictures, diagrams.

Step 3: Illustrate Applications of Knowledge*

Illustrate how the background information provided in Step 2 is applied in the field. At times include applications and examples on information sheets with background information. Alternatively, illustrate applications through other instructional methods such as lectures, models, demonstrations, experimentation, films and other audio-visual materials.

Step 4: Offer Opportunities for Practice*

Incorporate practice situations into your instructional materials as exercises for completion. The following methods can be used to practice knowledge or skills:

1. Demonstrating knowledge and facts through repetition and drill
2. Repeating manipulative skills
3. Demonstrating understanding of material through simulations and case studies
4. Applying principles to new situations and solving problems

* Refer to Chapter Three of this module for explanations of how to develop and use examples and practice situations.

Step 5: Offer Opportunity to Demonstrate Mastery

The final step is to incorporate into the materials an opportunity for apprentices to demonstrate mastery of the competency by demonstrating successful performance of the skill or knowledge. Mastery can be demonstrated through any type of performance testing situation. Once standards for performance are established you can devise testing situations to measure attainment of the criteria. Evaluating apprentice learning is the topic of an entire module in this series. Information provided Module #9, *Evaluating Apprentice Performance*, particularly Chapter 2—Assesses Apprentice Knowledge and Skills, will assist you in developing criterion-referenced tests for inclusion in your competency-based materials.

Example

Prior to the start of her related instruction program in basic safety, Eleanor Jones reviewed her Plan for Instruction to determine what instructional materials she would use in the upcoming course. In doing this, she found that there were no materials available for developing competencies in prejob safety planning for carpentry apprentices. Thus, Jones decided to develop competency-based, criterion-referenced materials using the steps outlined in this module. First, she identified the knowledges that would be required to learn the planning skills. She listed them as follows:

Knowledges	Materials Available
Causes of accidents in building trades	____
Accident prevention in building trades	____
Dangerous noise levels	✓
Handling tools safely	✓
Lifting and carrying materials	✓
Using ladders and scaffolds	✓

The major skill to be learned was identified as how to plan for a safe work site. Some of the components of this skill which Jones listed are:

- Evaluating a work site
- Identifying hazards
- Preparing guidelines for accident prevention
- Planning for the use of protective devices

She next decided that the best ways to practice the skills were:

1. To review case studies and illustrations to practice identifying hazards.
2. To visit selected work sites to evaluate their overall potential for accidents and accident prevention.
3. to practice listing safety guidelines for completing various aspects of a job, including the use of safety devices.

These same types of situations would then be used to enable the apprentices to demonstrate their mastery of the competencies.

Once Jones had identified the four components of her competency-based materials, she proceeded to develop the materials. First, she wrote an information sheet on causes of accidents and accident prevention in the building trade, incorporating numerous illustrations and examples from her own experience. She also assembled the materials that were available to provide instruction for the other prerequisite knowledges. Finally, she planned activities for developing, practicing and demonstrating the skills and packaged the materials in a self-instructional format.

Additional Information

The following resources offer additional information on developing competency-based, criterion-referenced materials. Also, information presented in other chapters of this module and Modules #3 (Planning Related Subjects Instruction) and #9 (Evaluating Apprentice Performance) is closely linked to the skills involved in developing competency-based materials.

G.E. Hall, and H.L. Jones. *Competency-Based Education: A Process for the Improvement of Education.* (Englewood Cliffs, NJ: Prentice-Hall, Inc., 1976).

C.R. Finch and J.R. Crunkilton. *Curriculum Development in Vocational and Technical Education* (Chapter 10). (Boston: Allyn and Bacon, Inc., 1979).

Self-Test Exercises

Answer the questions below in the space provided or on separate work paper. Compare your answers with those provided in the appendix of the booklet.

1. What are the four components or building blocks of competency-based instructional materials?

   a. _____

   b. _____

   c. _____

   d. _____

2. Refer to the Plan for Instruction which you developed as an exercise in Module #3. (Or use another instructional plan you have available). Identify at least one competency area which would be appropriate for materials development. List the knowledge, applications, practice situations and evaluation methods which are appropriate for attaining and measuring the attainment of the competency.

3. For the competency you identified in Exercise 2, design instructional materials which will convey the required information and applications, and provide opportunity for practice and the demonstration of mastery.

5. Skill: Develop Introductory Overviews and Summaries

Introduction and Objectives

Writing and using introductory overviews and summaries are important because they are devices that assist adults to relate, to store, to transfer, and to incorporate new information with the knowledge that they already possess. Remember that even though use of summaries and introductory overviews may seem repetitious to you, to an apprentice considering the information for the first time, such devices offer an opportunity to compare the new information with previous experience as well as an opportunity to check new insights against the correct or best answer.

This unit of materials will teach you how to prepare and use overviews and summaries in the instructional setting. When you have completed your work you will demonstrate your competence by being able to:

1. Critique examples of introductory overviews that might be used in the instructional setting;
2. Critique examples of summaries that might be used in the related subjects instructional setting;
3. Suggest how to use overviews and summaries in the instructional setting; and
4. Prepare overviews and summaries for your own use in related subjects instruction.

When and Why to Use the Skill

Despite the usefulness of overviews and summaries and the relative ease with which they can be developed and used, a surprisingly large number of trainers of adults omit using the devices because trainers incorrectly fear that adult learners will lose interest due to repetition. In fact, most adult learners prefer multiple mention of the most important points of the lesson because it helps to fix firmly in their working memory the new information.

As suggested by their names, the appropriate time for using overviews is when introducing new knowledge during instruction. The most appropriate time for using summaries is as you conclude your presentation of some subject and prepare to move to something else. In addition, you may find that brief summaries used at appropriate moments throughout the lesson will increase greatly the understanding and retention of information by trainees.

There are three advantages to using the introductory and summary devices. First, using overviews introduces information in terms of the overall generalizable concept, initial attributes and major facts as the lesson begins. Each attribute, point, or fact can be noted for explanation later in the lesson. As the major points are noted, you indicate how the points are related to each other *and* to information, knowledge or skills that have been mastered previously by the learner. The relationship of new information to that already possessed by the learner is especially critical for efficient learning. It helps to suggest applications of the new information and associations both to existing skills and to on-the-job work assignments.

Second, when overviews are used it alerts the learner to the expected flow and outcome of the lesson. This helps to focus attention. Overviews provide a mental schedule of information as well as the major points under which other information can be grouped.

Third, summaries offer a final opportunity to register main points. As importantly, summaries provide you as an instructor an opportunity to explain how the information under consideration is related to past information and to the information that will be presented in the next lesson. This transition between old, current and future information is of great importance to all lessons, especially for adult learners who may be working with unfamiliar material.

How to Prepare and Use Introductory Overviews

As used in these materials, the term introductory overview means a set of information in which is presented the overall organizing concept of the information as well as the major points to consider. Overviews help adult learners to focus attention on related subjects while reducing stress and anxiety associated with learning new and unfamiliar information. Also, overviews explain the relationship of major points to each other, to the overall concept being taught, and to information learned at a prior time. Finally, they usually help associate the new information to concrete instances of the information from the personal experiences of the learners.

Overviews can take many forms including questions, outlines, films, paragraphs or entire lessons. Usually they are reserved for use with verbal information. Always they begin with the most general information

and work toward specific applications. The basic steps in preparing and using overviews are:

Step 1: Identify Central Concept and Major Points

An overview has two parts: (a) an explanation of the most general concept in the lesson and (b) an outline of the major points that will be covered. You will have identified each of these in your initial lesson planning. List them in order of presentation in order to prepare the overview. Consider the overall unifying concept or theme under which each of the major points is grouped. For example, if you propose to teach a unit in the use of measuring devices such as calipers, you must first teach or review something about scapes—their types, dimensions, use and reading. However, you do not have to teach more background information than the appentice needs to understand calipers. Remember, calipsers—not scales—is the point of the lesson. In organization, however, use of calipers becomes a subset of measurement scales and tools. Similarly, if you were teaching a unit in the economic system and wanted to teach about price, you would first introduce material about supply and demand in order to explain how price is devised and what functions it serves. After explaining how price fits into supply and demand, you then focus specifically on the notion of price itself.

Step 2: Write Out Overview

Based on the principal concept of the lesson add the major points you want to make, write your overview. It should have three major parts. First indicate what the overall concept or ideas of the lesson is called, how it is defined, and what it does. Be sure you include the critical attributes of the concept. Do this either through direct explanation or by comparing the new information to concepts learned previously. Second, indicate through examples how the concept is important. Be certain to relate the concept to the work place of the apprentices. Third, list each of the major points of the lesson. Briefly define each and indicate how it is related to the basic concept under consideration.

Step 3: Present the Overview in the Lesson

The presentation or use of an overview in a lesson consists of four activities, none of which requires much time, but each of which is important. First, indicate that the lesson is beginning, that the lesson is about a particular topic and that the aim or purpose is some particular outcome. Indicating the aim or purpose is especially important for focusing attention.

Second, present the overview. Call specific attention to the explanation of the principal concept under consideration. Present each of the three parts of the overview in order: name of concept together with critical attributes; examples of how the concept is important in the workplace; and the list of major points to be covered in the lesson. Usually it is a good idea to indicate explicitly how the major points are related to each other.

Third, prompt learner attention to the information by recalling prior experience andf knowledge that is related to the overall concept or major points of the lesson. This use of comparative information is especially useful for adult learners.

Fourth, list the major points and unifying concept on the board or a sheet of paper. Then begin the formal lesson moving through the points, one-at-a-time. Indicate on the board your progress as you work through the information. Also explicitly indicate how the information is related to the unifying concept.

How to Develop and Use Summaries

Summaries are easy to develop and use, and they provide excellent reinforcement for learning. Concisely stated, the steps involved in their use are as follows:

Step 1: Abstract Major Points of Lesson

The first step in preparing and using summaries is identical to that of developing and using advanced organizers; again you must note in written form the major points and critical materials of the lesson. By writing them out, you reinforce in your own memory the points. In addition, it provides you with an opportunity to decide on the exact wording you wish to use to express or reinforce the point.

Step 2: Draw Together Examples to Illustrate Points

Review the examples you used to illustrate each major point and other relevant examples. Select several to use in the summary. Choose examples that are easy to remember and have special meaning for apprentices. Always reuse examples that provoked a good bit of discussion since they will be remembered. Note the examples cryptically beside each major point.

Step 3: Arrange the Points in Order

Arrange the major points and examples in the best order. Make sure that the order assists with applying the information to work as well as with the transition to the next lesson.

Step 4: Use Example in Instruction

It is a good idea to set aside a specific amount of time—usually 5 to 10 minutes—at the conclusion of a lesson for summarizing. When you are ready to begin,

demand everyone's attention. In addition, clearly indicate that the material you are about to present is a summary and should be attended to.

Step 5: List Major Points

As you summarize, list the major points of information in one of several ways: numerically; chronologically; or on a flip chart, overhead, or blackboard. Suggest how each point is related to every preceeding point and introduce necessary examples and supporting materials.

Step 6: Add Emphasis

Be sure that you add auditory and visual emphasis to points in the summary, as needed. Indicate the importance of different information. Show your enthusiasm and determination regarding the information in both the tone of your voice and the words you choose.

Step 7: Express Relationships Among Points

As you express the major points, show how the points are related to each other. Suggest how the information fits together into a total complement of skills or knowledge. Also be certain to indicate how the information relates to other information that has been mastered or is about to be presented. This idea of transition is especially important for helping apprentices to gain an overall perspective on their chosen trade or craft.

Example

The apprentices in Ian Michalson's related instruction class often indicated that they had difficulty following his presentation of information. They found his lectures on scientific principles to be especially confusing and difficult to follow for note taking and committing to memory. Michalson decided that he needed some device to help him bring a more logical order to the information he taught. As he read these materials, he decided that perhaps introductory overviews and summaries would serve as the device for which he had been looking. He sat down the day before his next class for one half hour to organize the materials and construct the overview and summary. The lesson he was to teach was on the principles and use of simple machines. Ideas of greatest importance were levers and fulcrums. As he organized the materials he realized that he needed to introduce the concepts of force and inclined planes in order to make the information on levers and fulcrums complete. Further, he realized that the knowledge the apprentices already possessed on inertia and kinetic energy would be useful as a place to start. He developed an outline as displayed in Figure 4 around which he wrote his overview. He presented and explained the main concepts both directly and by way of comparing them to information mastered previously. Notice he also used examples to demonstrate the basic ideas. Michalson used the same overview as a summary at the end of the lesson to review and reemphasize each major point.

Figure 4. Outline of Introductory Overview

Basic Concepts:

- Force
- Inclined Planes

Prior Knowledge of Importance:

- Inertia
- Kinetic Energy

Major Topics:

- Levers
- Fulcrums
- Force vectors and amounts

Examples To Use:

- Jacks
- Crow Bars
- Handtrucks
- Hammers

Additional Information

For additional information about the development and use of overviews and summaries you might choose to read portions of:

B. Joyce and M. Weil. *Models of Teaching* (Englewood Cliffs, New Jersey: Prentice-Hall, Inc.; 1972).

D.P. Ausubel and J.D. Novack. *Educational Psychology: A Cognitive View* 2nd edition (New York: Holt, Rinehart and Winston; 1978).

Self-Test Exercises

Answer the questions below in the space provided or on separate work paper. Compare your answers with those provided in the appendix of the booklet.

1. What are the major advantages of using overviews and summaries?

2. How would you use an overview and summary in a lesson?

   Overview *Summary*

3. Construct an introductory overview or a summary for your own related subjects teaching context.

6. Skill: Prepare Self-Instructional, Individualized Materials

Introduction and Objectives

Apprentices enrolled in related subjects instruction may differ in trade specialities as well as personal characteristics such as abilities, interests and instructional needs. Thus it is often necessary to provide instruction on an individualized basis, providing for self-pacing, scheduling, and selection of learning activities. At times you will be able to locate appropriate individualized materials for use in providing related instruction. More frequently, however, you will be responsible for preparing your own materials. This unit provides you with some guidelines and procedures for developing self-instructional, individualized materials for related instruction. After completing the unit, you should be able to:

1. Define the components of individualized learning modules.
2. Suggest alternative learning activities for attaining learner objectives.
3. Develop an individualized learning module for a topic in related instruction.

What is an Individualized Learning Module?

A format typically used to provide individualized instruction is the learning module or learning activity packet. It is a self-contained package which offers alternative paths for individual learners to achieve specific instructional objectives. Thus, the module manages the learning process by guiding the apprentice through various instructional activities, while the instructor provides assistance to individuals or groups as needed.

A module generally consists of the following components, though formats and terminology used by instructors vary. Figure 5 illustrates trainee progression through the various components.

Introduction

1. Rationale for completing the module:
   - why study the topic
   - when, where and how it will be used.
2. Overview of content:
   - introductory overview or
   - flowchart.
3. Prerequisite skills, knowledges and attitudes needed to complete the module.
4. Table of contents.

Expectations

Objectives of the module: What the apprentice is expected to know, do or feel after completing the module.

Pre-Assessment

A test of the present attitude, skill and knowledge levels of the apprentice.

Learning Activities

One or more ways the apprentice may attain the learning objectives.

1. Directions for completing module, what activities make up alternate paths.
2. Subject matter and technical information.
3. Outside resources.
4. Application exercises.

Post-Assessment

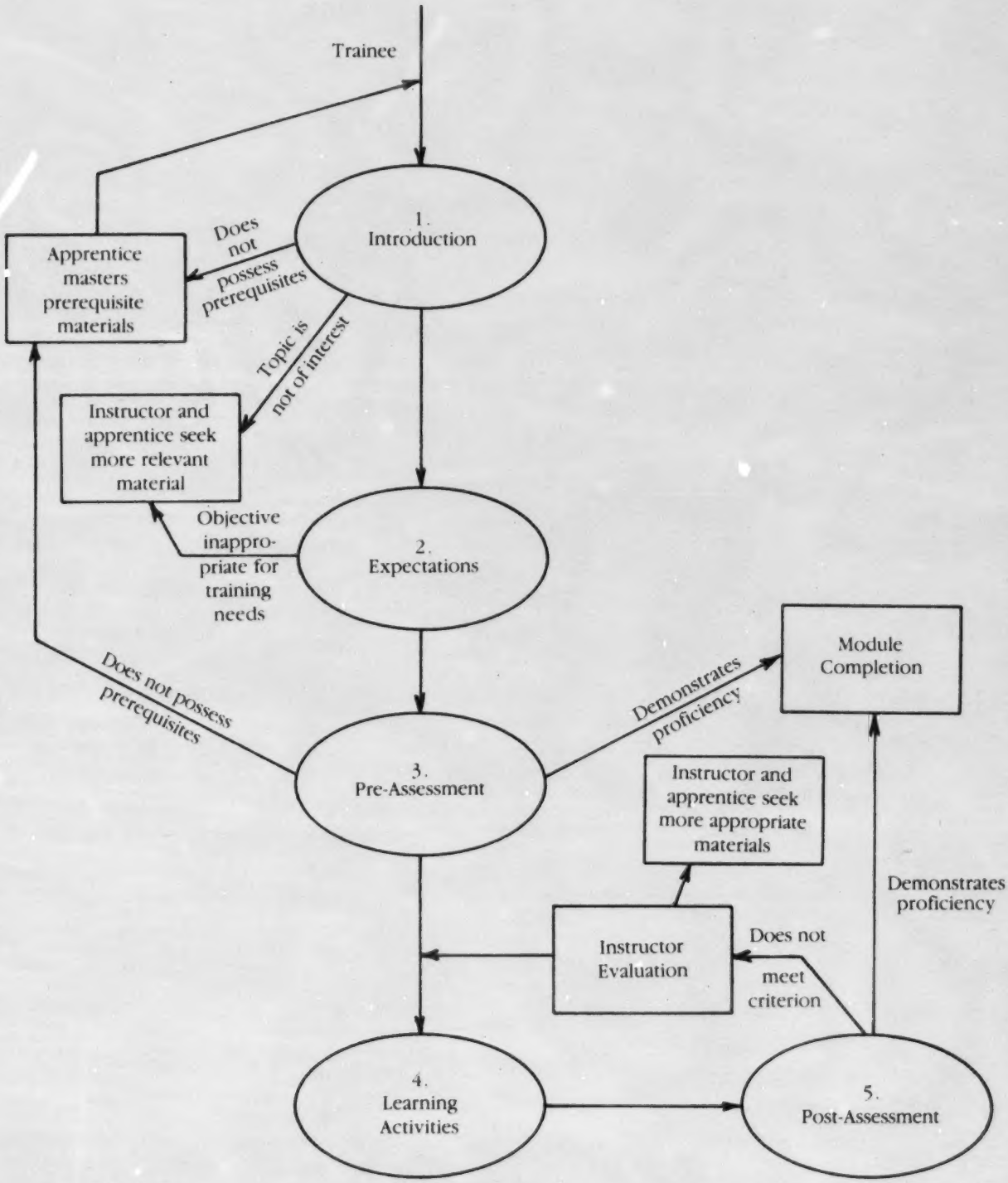
A test of the knowledge, skill and attitude levels of apprentice after completion of learning activities. Used to determine whether the apprentice attained the instructional objectives of the module.

When and Why to Develop Individualized Materials

The primary reason for developing individualized materials is to encourage learning in your related instructional setting. Learning packages do this by offering alternative paths to skill and knowledge acquisition through a variety of individually selected instructional activities. Modules also, when properly prepared, improve learning by:

- Reinforcing correct responses by apprentices.
- Offering opportunities for apprentices to practice skills and knowledge.
- Providing the instructor time to assist individual apprentices as needed.
- Allowing apprentices to proceed at their own pace.

Figure 5: Progression Through A Learning Module



Of course, you should utilize pre-prepared materials to the extent you can in providing related instruction. When materials appropriate for the topics of study and the apprentices in your charge are not commercially available, it is up to you to prepare them. The more diverse your apprentices are, the more important it is to develop such materials. They do, however, require considerable effort on your part to develop and to manage. Nevertheless, they have several advantages. First, they are easier and less costly to update and revise than are conventional instructional materials. Also, modules make efficient use of your instructional time by guiding the individual learner, presenting to apprentices basic facts and concepts and providing a logical process and future foundation for lesson planning.

How to Develop Individualized Materials

Begin the development activity as you devise your Plan for Instruction. Step by step procedures for producing a module are presented in the following sections. The product of completing these steps may range from a one-page handout to a 40 page instructional resource. The complexity and extent of your developmental efforts are your decision. Remember, developing the materials may be a time consuming process.

Step 1: Determine the Objectives of the Instructional Materials

First, for those topics best addressed through individualized materials, decide what and how many objectives you need. This is the scope of the instructional materials you will be developing. What you include will affect the length and format of the materials as well as the instructional activities you design. For example, an abbreviated objective may be addressed by one instructional activity, while a broader topic may require a sequence of activities to effectively convey the knowledge, skills and attitudes.

Secondly, specify the entry knowledges and skills for use of the module. This will come from your Plan for Instruction, where you have sequenced the objectives or content of the related instruction program. The prerequisites are the skills, knowledge and activities from the PFI that precede those you plan to deal with in the instructional module

Step 2: Develop Pre and Posttests

Developing and using a pretest for evaluating apprentices' levels of skill and knowledge is an optional task. A pretest is useful for a number of reasons:

1. Taking a pretest serves as a learning experience itself.
2. A pretest determines if an apprentice has the prerequisites required to pursue the learning activities.
3. A pretest determines whether the apprentice already possesses the skills, knowledge and attitudes addressed by the module.
4. It serves as a motivational tool.

A posttest is necessary to determine whether the apprentice has attained the objectives of the instructional materials. If you handle evaluation of apprentice progress by other methods, this step is not required.

Both pre and posttests can be generated directly from the objectives of the materials. If you have developed objectives as specified in Module #3 of this series, your objectives will contain standards for successful performance. These standards indicate what you should include in a pre or posttest. For example, a prototype objective presented in Module #3 was as follows:

> Each plumbing apprentice will solve a set of math problems about the necessary fall in drainage lines achieving a score of 95% within 1 centimeter tolerance on a paper and pencil test of written problems using blueprints.

A pre or posttest of performance for this objective would consist of a set of problems to calculate the fall in drainage lines.

Step 3: Design Learning Activities

This third and most important step is to design ways that apprentices can acquire what they need to know or do. That is—How can they achieve the objectives of the instructional packet? This is the crux of your developmental activities and requires four substeps:

a. Examine apprentice characteristics.
b. Design one or more learning paths for attaining desired knowledge, skills and attitude.
c. Develop or obtain support materials and media.
d. Devise application exercises.

Step 3a: Examine Apprentice Characteristics. *

Using individual assessment data list those characteristics of the apprentices in your related instruction course that will effect your design of instructional activities. For example, a group with below average reading levels will affect your selection of reading materials. Apprentices with a short attention span would require a variety of activities of brief duration. Some other characteristics you should examine and take into consideration in the steps which follow include:

* Module #7 this series, *Providing for Individual Needs* covers the topic of identifying individual needs.

- Motivational level
- Preferred mode of learning
  - reading
  - interacting
  - doing
  - problem solving
  - drill
  - observing
- Degree of independence
- Learning rate
- Attention span
- Initiative
- Adaptability
- Interests
- Employment and educational history

Step 3b: Design Learning Paths

If the characteristics of your apprentices are very different, design alternative ways through which apprentices can know the materials and achieve the instructional objectives. Each learning path could consist of one or more activities. For example, the activities you select for the sample objective for plumbing apprentices presented in Step 2 might be to:

1. Read a three-page information sheet describing the rationale for calculating fall, the relevant mathematical principles, and example computations.
2. Complete a set of 10 application problems.

An alternative for activity 1 could be provided, consisting of an instructor small-group presentation of the principles and procedures involved.

A list of instructional activities which you may wish to use in designing learning options is presented in Figure 6. Provided is the extent to which each activity possesses various characteristics which facilitate learning:

- Is the activity individualized?
- Does it require active participation on the part of apprentices?
- Does it provide an opportunity to practice skills, knowledge or attitudes?
- Does the activity provide reinforcement (reward or feedback on performance)?

Also included is whether the activity can be performed independently, another desirable characteristic if instructor time is limited and apprentices are able to work on their own.

In addition to these characteristics, take into consideration the following factors when selecting learning activities. Some tradeoffs may be required.

- How well have the activities worked in the past for similar skills, knowledge, or attitudes?
- Are the activities in line with the particular characteristics of apprentices?
- Are the time and other logistical requirements of the activities consistent with your Plan for Instruction?
- Are existing support materials and media available for use? If not, do you have the time and expertise to develop them?

Step 3c: Develop Support Materials and Media

Use existing resources such as textbooks, filmstrips, and handouts to the extent possible. However, there will be instances where it will be necessary to develop support materials or media. For example, if your apprentices are in different trades, you may wish to personalize a standard presentation of related instructional material by adding relevant examples and illustrations. Likewise, processes which are unique to a local plant may require you to develop related instruction materials that are tailored to the situation.
situation.

There are three major types of individualized support materials that you may be required to prepare:

- *Information sheet*—Written material providing background subject matter and technical information.
- *Job sheet*—Written instructions and support materials (required equipment and materials, diagrams and illustrations) for performing a job. This could be a task, operation, project—something active on the part of the apprentice.
- *Assignment sheet*—Written assignments for the apprentice to practice a skill or knowledge. These could be written or problem solving activities, information gathering and so forth.

Some guidelines to assist you in preparing instruction sheets follow.

- Know your topic before writing. If it is a new area or something which you are not completely sure of, get some assistance from the field.
- Use a logical method for organizing information:
  Chronological order: as events occur in time.
  General to specific information.
  Prerequisite order: present ideas or topics first which are required for subsequent knowledge or skills.
  Concrete to abstract: tie information to examples that apprentices can relate to and then move to the more general case.
- Select a format that is appropriate for what you are trying to convey.
  Information/Examples
  - Narrative text
  - Questions and answers
  - Outline form

  Procedures
  - Step by Step
  - Outline form

Figure 6. Instructional Activities for Possible Inclusion in an Instructional Module

	Characteristics of Activities*				
	Is the activity individualized?	*Does it require active participation?*	*Does it provide opportunity for practice?*	*Is it an activity that can be performed independently?*	*Does the activity provide reinforcement?*
Activities Centered Around the Instructor					
Lecture	No	No	No	No	No
Team Teaching	P	No	No	No	P
Tutoring	Yes	P	P	No	P
Instructor demonstration	P	No	No	No	No
Discussion	No	S	S	No	P
Small group seminars/workshops	S	P	P	No	P
Guest Speakers	No	No	No	No	No
Question and answer sessions	No	Yes	S	No	Yes
Activities Centered Around the Apprentice					
Building or working with models	P	Yes	Yes	Yes	P
Doing projects	P	Yes	Yes	Yes	P
Running experiments	P	Yes	S	P	P
Working in the shop	P	Yes	Yes	P	P
Going on a field trip	P	S	No	P	No
Observing a skilled worker	P	No	No	P	No
Cooperative apprentice group experiences	P	Yes	P	No	Yes
Activities Centered Around the Apprentice					
Playing games	P	Yes	Yes	P	Yes
Oral presentations	P	Yes	P	Yes	P
Simulating real-life experiences	P	Yes	Yes	P	P
Role playing	P	Yes	Yes	No	Yes
Reacting to scenarios or case studies	P	Yes	Yes	P	P
Information gathering	P	Yes	No	Yes	P
Using a vertical file of resources	P	S	No	Yes	P
Problem solving	P	Yes	Yes	Yes	Yes
Planning individual activities	Yes	Yes	S	Yes	S
Critiqueing experiences	P	Yes	S	Yes	P
Reading written material	P	No	P	Yes	P
Using programmed instructional materials	S	Yes	Yes	Yes	Yes
Using computer assisted instruction	S	Yes	Yes	Yes	Yes
Using audio-visual materials	P	No	P	Yes	No

*Yes —the characteristic is built in
No —the characteristic is not associated with adults
Somewhat (S) —activity possesses the characteristic to some extent but not as much as some other activities
Possibly Could (P) —it is up to the instructor to incorporate the characteristic in the activity.

Exercises
- Questions and answers
- Step by Step

- Write clearly and concisely.
- Include adequate subject matter to make your point, but avoid redundancy.
- Present information in small steps.
- Use illustrations.
- Provide self-checks (study questions, check lists, answers to exercises).
- Keep it short.

Support media are quite useful for complementary instructional activities in your written materials. Media you should be able to develop or utilize include:

- Chalkboard
- Flip charts
- Transparencies
- Still pictures
- Maps, charts and graphs
- Illustrations
- Models

Media which you can purchase, rent or borrow include:

- Audio tapes
- Video tapes
- Motion pictures
- Slides/filmstrips

Step 3d: Devise exercises

Finally, if you did not develop exercises as a part of Step 3c, devise exercises that require application of the related instruction principles. Since this is such an important part of instruction, in particular the individualized learning process, this skill is discussed as a separate chapter of this module—"Construct useful performance-related examples, problems and practice situations."

Step 4: Write Module Introduction

Once you have defined the objectives and devised the individualized learning activities, you are prepared to write a clear, concise and informative introduction to the learning activity packet. First present the rationale for the apprentices to complete the module. This should have been clear to you before starting the preparation of the module and should address the following questions:

- Why study the topic?
- When will it be applied?
- Where will it be applied?
- How will it be used?

Next, provide an overview of the contents of the module. Preparation of an introductory overview, flow chart or graphic illustration helps to convey content. This may be handled by a table of contents, the third component of the introduction. In the table of contents, be sure to provide sufficient headings to direct apprentices to any sections that might be of interest or use. Do not forget to number your pages. Finally, incorporate the prerequisite skills, knowledge and attitudes that you identified in Step 1.

Step 5: Assemble and Produce Module

All that remains is to put your materials in proper order and arrange for their reproduction. Remember, your final product could consist of a couple of pages or be quite lengthy. Thus, you should consider what reproduction costs will be and whether they are within your budget *before* you develop the module. Be sure that duplication is of high quality, so that all text and figures are clear, accurate and easy to read.

Example

Rob Johnson is an instructor at an area vocational technical center. Part of his responsibilities is to offer a night class where he teaches related subjects instruction for apprentices at local industries. Since the class is generally composed of apprentices of varying abilities in a variety of occupational specialties, Johnson decided to try a primarily individualized approach. A set of modules for teaching apprenticeship related instruction was available for his use. After reviewing the modules, he decided to use them as the major resource in his class and to develop his own individualized materials to supplement the modules when needed. One topic in his instructional plan where individualized materials were not available was basic tools. Portions of the learning activity packet that he developed for one of the objectives of this topic are in Figure 7. Note that the materials do not have to be lengthy to contain all of the essential elements of a learning module.

Johnson designed activities and identified resources for achieving objectives 2 and 3 in a similar manner. He also developed a posttest for measuring apprentice performance, wrote the information sheet for Activity 1a from previous lecture notes, and developed a series of exercises (Assignment Sheet #3b) as part of Activity 3b. He found the individualized materials to be quite effective, and the apprentices liked having a part in selecting their learning paths.

Figure 7. Johnson's Sample Learning Activity Package

Knowledge of Basic Tools

Introduction

Tools are essential to most apprenticeable jobs. Even if you don't use all of the basic tools on a day-to-day basis, there will be times when a task requires that you know *what* tool to use and *how* to use it safely. This module will teach you what you need to know about basic tools. There are three activities which you will complete. You select between two options to complete each of the activities. Before proceeding with the activities, read the objectives of this unit and complete the pretest.

Contents

Objectives 1
Pretest 1
Activity 1 2
Activity 2 2
Activity 3 3
Information Sheet #1a 4
Assignment Sheet #3b 8
Posttest 9

Objectives

After completing this unit, you will be able to:

1. Identify the basic tools for apprenticeable jobs with 95% accuracy.
2. List three applications of each tool with 90% accuracy.
3. Describe how to use each tool safely.

The first two objectives will be measured by your performance on the Posttest on page 9. Your attainment of objective 3 will be measured through a demonstration of the use of a sample of tools.

Pretest

Complete the following questions. Check your answers with those on Page 8. If you answered 9 or 10 of the questions correctly, it is not necessary to proceed. Talk to your instructor about some alternative activities you can do.

(Questions are omitted to save space—sample evaluation instruments are provided in Module #9 of this series.)

Activity 1: Complete one of the following activities.

1a. Read information sheet #1a, "Identification of Basic Tools," on pages 4–7 of this booklet. Complete all of the exercises contained in the reading.

-or-

1b. Get a group of five or more apprentices in your class together and arrange with your instructor for a viewing of the film, "An Introduction to Shop Tools." While viewing the film, make a list of all the tools presented. Talk with your on-the-job instructor to find out which of the tools are used most frequently in your job.

Additional Information

The following resources provide more detailed information on why and how to develop individualized instructional materials.

State Fair Community College. *To Develop and Test Improved Procedures for the Development and Distribution of Quality Individually Mediated Instructional Materials in Vocational Education.* Sedalia, MO: State Fair CC, 1979, ED181215. (Also includes an Instructor's Guide to Module Development.)

G.E. Hall and H.L. Jones. *Competency-Based Education: A Process for the Improvement of Education.* Englewood Cliffs, NJ: Prentice-Hall, Inc., 1976.

C.R. Finch and J.R. Crunkilton. *Curriculum Development in Vocational and Technical Education* (Chapter 10). Boston: Allyn and Bacon, Inc., 1979.

Self-Test Exercises

Answer the questions below in the space provided or on separate work paper. Compare your answers with those provided in the appendix of the booklet.

1. List the five components of an individualized learning module.

   a. _____

   b. _____

   c. _____

   d. _____

   e. _____

2. For each of the following topics suggest two or more learning activities which would be appropriate for conveying the skills, knowledge or attitudes. You may refer to Figure 6 in this chapter.

   a. Converting fractions to decimals.

   b. Laws concerning occupational safety and health.

   c. Reading blueprint sections and cross-sections.

   d. Giving constructive criticism.

3. Select a topic in your related subjects plan for instruction (1) that you feel would be best taught in an individualized manner and (2) for which there are no individualized instructional materials. Using the steps outlined in this unit, develop a learning activity packet for providing instruction on the topic. Define your objectives, develop pre and posttests, select learning activities, develop or obtain necessary support materials and write introductory and procedural sections. If you are satisfied with the module, reproduce it and try it out on your apprentices. Their reactions and comments should provide you with useful information for revising the module and for developing future learning activity packets.

7. Appendix

Answers to Self-Test Exercises

2. Skill: Prepare Written Instructional Materials for Adult Learners Such as Apprentices

1. Ownership: provide examples; provide practice for trial and error learning; match vocabulary to twelfth grade level or the ability of learners; rewrite sentences into typical English form, avoid long, complicated sentences; use topic sentences; compare new information with prior learned information.

2. Comfort/reduce stress: provide for successful experience; self-pace materials; make materials competency-based; limit number of major topics presented to 5-7 and the number of pages per topic to about 10; provide complete directions/ instructions; provide explicit performance directions.

3. In combination with more difficult materials written; are written materials to express time relationships and visual material to express spatial relationships.

3. Skill: Construct Useful Performance-Related Examples, Problems and Practice Situations

1a. Problem solving: Active learner involvement; motivation; check procedures and products; realistic; involves many skills and knowledges; improves learning and transfer; increases learner responsibility for behavior.

1b. Drill: Development of speed, accuracy and prevision of answer (automatic answer); particularly good for manipulative skill teaching, in situations where there is limited time available, and where basic information must be mastered.

2. Review major points for which you want to use examples;
generate examples for each major point;
select or construct non-examples;
prepare necessary materials for lessons;
sequence/order the examples;
use examples in the lesson.

3a. Problem: Not enough examples of the major points together with a lack of non-examples.
Solution: Add examples so that she presents sets of samples; use non-examples to demonstrate limits of information; use practice.

3b. Problem: Practice situations were poorly planned and poorly orchestrated.
Solution: Set aside short amounts of time for drill and use contest as a format; present problem solving situations using the guidelines in materials. In particular he must emphasize the points/processes under consideration with example and problem sets, provide all necessary materials in advance and summarize what went on at the conclusion.

4. Skill: Develop Competency-Based, Criterion-Referenced Materials

1. Components of competency-based materials:
   a. Background information (facts, concepts, etc.)
   b. Applications of knowledge to trades
   c. Opportunities for competency development (practice)
   d. Opportunity to demonstrate mastery.

5. Skill: Develop Advanced Organizers and Summaries

1. Introduces lessons in way that defines the relationships of overall concepts and major points; alerts learner to expected flow of materials to help focus attention; offers opportunity to emphasize and reiterate major points.

2. Introductory overview
   - introduce lesson aim and purpose
   - present advanced organizer (overview, topic, examples and major points)
   - prompt learner attention by recalling associated prior experience and knowledge
   - list major points and unifying concept on board and point to topics as you work through the materials

6. Skill: Prepare Self-Instructional, Individualized Materials

1. Introduction
   Expectations or Objectives
   Pre-assessment
   Learning activities
   Post-assessment

2a. First it would be necessary to convey the principles and procedures behind the operation. This could be done through activities such as lecture, tutoring, demonstration or reading. Second, it would be necessary to provide an opportunity for practice, that is, problem solving activities.

2b. A number of different activities would be appropriate:
- lecture
- discussion
- guest speakers
- reacting to case studies
- information gathering
- vertical file
- reading
- audio-visual materials

2c. This is most appropriate to:
- Tutoring
- Demonstration
- Question and answer
- Models
- Games
- Problem solving

2d. Actual practice would be beneficial after an instructor or speaker demonstration:
- Simulating life experiences
- Role playing
- Reacting to scenarios or case studies
- Critiqueing experiences.

Posttest

Directions: Read the following questions and write your answers in the spaces provided. Check and score your answers with the suggested answers and directions that follow the questions. If you answer at least 65 percent of the questions correctly, continue your work in Module #5. If not, repeat the sections of this module with which you had greatest difficulty.

1. Check each item that is a preference or characteristic of most adult learners.
   a. Adults prefer to work with explicit, concrete materials
   b. Adults attempt to relate new information and skills to prior learning
   c. Adults need to feel ownership of materials
   d. Adults must visualize, apply and practice skills and knowledges
   e. Adults tend to learn less effectively in stressful situations
   f. Adults differ dramatically in individual ability

2. Circle the letter of the item that is a major advantage of using individualized materials:
   a. They permit self-pacing of learner activity
   b. They are relatively quick to develop
   c. They require less time to manage in class than other materials
   d. They are shorter usually than other types of materials

3. There are instructional devices that draw together the primary information of a lesson. You can use the procedures at the beginning and end of a lesson. What are these instructional devices called?
   Answer a. _____ b. _____

4. What is the name of the type of practice in which you present a written, real-life situation to an apprentice and require that the apprentice use acquired knowledge and skills to resolve the situation? Answer: _____

5. Circle the letter of the following item that is *Not* necessarily a recommended procedure associated with preparing written materials for adult learners?
   a. Hold the number of new ideas per lesson to five, six or seven items
   b. Use standard English sentence form for most sentences
   c. Use action verbs and concrete examples to make points
   d. Use photographs to explain difficult concepts
   e. Use vocabulary that you find in most newspapers

6. Suggest at least three recommendations to bear in mind as you prepare to use practice situations in your training sessions.
   a. _____
   b. _____
   c. _____
   d. _____
   e. _____

7. List the five components of individualized materials.

   a. _____

   b. _____

   c. _____

   d. _____

   e. _____

8. Patricia Maulany finished her presentation on surface measurement to a group of apprentice tile layers and plasterers with the following summary statement. Indicate in the space provided at least two limitations of the summary. Offer at least one suggestion to improve the summary.

   "To summarize the lesson, remember that perimeter is the length of the border of an object and area is the amount of space within the borders. The important formulas are $A = \pi r^2$; $C = \pi d$; $A = lw$; $A = \frac{1}{2} bh$ and $P = S_1 + S_2 + S_n$. See you next time."

   a. Limitations: 1. _____ 2. _____
   b. Suggestions to improve: 1. _____

9. Nathan Dobbins always used examples in his lessons. He used instances from his experience as well as suggestions from apprentices. He sequenced examples to illustrate major points and followed the general guidelines for their use in class. Still, he felt his use of examples left something to be desired. Suggest at least one additional technique Dobbins might try to improve his use of examples.

   Suggestions: _____

10. Read the following excerpt for a set of related instructional materials on basic science. Indicate in the space provided at least 2 of the limitations of the materials in terms of what you know about the design of effective written materials for adults.

    As one begins to measure that, one must remember that heat is the quantity of kinetic energy due to molecule movement contained in a body. One can measure it in one of two ways, (1) the calorie or (2) the British thermal unit (Btu). A calorie is the amount of heat required to raise the temperature of 1 gram of water 1 degree Celsius. Since this is such an extremely small unit of this measure, it is customary to express energy values in larger units called kilograms. One kilogram equals one thousand grams. When expressed as the fuel value of a food, 1000 grams often is expressed a 1 Calorie.

    Answers: a. _____ b. _____

11. Jason Paltz taught related instruction to apprentice electricians. He had emphasized six specific building code requirements in his recent training and wanted to be sure that apprentices understood and remembered the code. What kind of practice would you recommend he use:

    Answer: _____

12. Yosa Levine trained apprentice welders in related instruction. He had just demonstrated the proper procedure for a particular type of weld. What kind of practice would you recommend he use?

    Answer: _____

Answers to Posttest

1. a, b, c, d, e, f, (if you got three correct, count as one point; if you got six correct, count as two points)
2. a
3. a. introductory overviews and b. summaries
4. case study or problem solving
5. d
6. Any three of the following answers are acceptable: (one point for each of three answers)
   a. choose only the most important points to illustrate; avoid unimportant points
   b. use situations that combine practice of skills and knowledge
   c. keep directions short and simple
   d. provide enough information so that expectations are clear and the situation is understood
   e. be sure that the situations have a clear purpose and are realistic
   f. use appropriate language and provide all necessary materials
   g. devote a portion of each lesson to practice
   h. introduce the practice situation by reminding trainees of the major points under consideration.
7. The components of individualized instructional materials are: (To be counted as correct you must express the idea—not the exact words—of each item)
   a. introduction (rationale, overview, table of contents and list of skills
   b. expectations or objectives (what are you expected to be able to do after training)
   c. preassessment (what do you know before training)
   d. learning activities (materials, examples, exercises and so forth)
   e. post assessment (how much do you know after training)
8. a. Limitations (any two of the following; one point for each)
      1. Did not illustrate points or offer examples
      2. Did not arrange points in order
      3. Did not emphasize anything
      4. Did not explain (again) relationship between points
   b. Suggestions (any one of the following; one point for answer)
      1. Add examples to illustrate points
      2. Suggest relationship among points and the importance of each
      3. List points on board, paper or projector
      4. Provide some order to the points offered.
9. Suggestions (any one of the following)
   a. use more than one example (usually 2–3) to illustrate each major point
   b. introduce non-examples
   c. use a variety of formats (handouts, films, tools) to explain examples

10. Limitations (any two of the following; one point for each)
    a. language is inappropriate and too formal
    b. too many new ideas introduced in too short a space
    c. sentences are too long and complex (not standard form)
    d. there are no examples and no references to prior kowledge
11. Simulation or case study
12. Drill

Scoring: The value of each question is as follows:

1. worth 2 points (one point for each set of three checks)
2. worth 1 point
3. worth 1 point
4. worth 1 point
5. worth 1 point
6. worth 3 points (one point for each of three required answers)
7. worth 1 point
8. worth 3 points (one point for each of two limitations and one point for suggestion)
9. worth 1 point
10. worth 2 points (one point for each of two limitations)
11. worth 1 point
12. worth 1 point

Total possible point value is 18. You must score at least 12 points to complete, successfully, this posttest.